

# **EXHIBIT 10**

UNITED STATES DISTRICT COURT  
NORTHERN DISTRICT OF CALIFORNIA  
OAKLAND DIVISION

CASE NO.: 4:17-cv-06252-YGR

JEFF YOUNG, individually and on behalf of all others  
similarly situated,

Plaintiff,

-vs-

CREE, Inc.,

Defendant.

\* \* \* \* \*

VIDEOTAPED

DEPOSITION OF: GARY R. ALLEN, PhD

DATE TAKEN: January 22, 2020

TIME: 10:00 A.M.

PLACE: 325 S. ORANGE AVENUE  
ORLANDO, FLORIDA 32801

REPORTED BY: MICHELLE PULIDO STUBBEN, FPR,  
COURT REPORTER, NOTARY PUBLIC

\* \* \* \* \*

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## C O N T E N T S

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## S T I P U L A T I O N S

It is hereby stipulated by and between counsel for the respective parties that the reading and signing of the deposition be reserved.

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## EXHIBITS

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1 A. Okay.

2 Q. And do you see -- I'm looking at paragraph  
3 three, which has a heading above it summary of opinions;  
4 do you see that?

5 A. Yes.

6 Q. Does this paragraph three, which has several  
7 subparagraphs below it, contain all of the opinions that  
8 you intend to give at trial in this matter?

9 A. Yes.

10 Q. I want to focus specifically on paragraph  
11 three, subparagraph three; do you see where I am?

12 A. Yes.

13 Q. Okay. And you give an opinion that states,  
14 the Cree LED lamps will commonly experience failure in  
15 advance of the advertised product life, less than one  
16 year; do you see that?

17 A. Yes.

18 Q. Did I read that accurately?

19 A. Yes.

20 Q. Please define what you mean by failure in that  
21 sentence?

22 A. Failure for an LED lamp or light bulb can mean  
23 one of several things, most obvious is it fails to  
24 light, turn on the switch, it does not light. Other is  
25 that the light output might be below some

1 specifications, typically 70 percent of initial would be  
2 considered failure. Another might be the color shifts  
3 from an initial point in units defined in the lighting  
4 industry as DUV prime of seven steps.

5 Another might be flickering, which can be very  
6 annoying. And I would say those are the four primary  
7 reasons that a lamp would be considered to have failed.

8 Q. In that sentence, that paragraph three,  
9 subparagraph three, when you use the word failure; is  
10 there a particular type of failure that you are  
11 referring to out of the four that you just described?

12 A. It would be any of the four.

13 Q. And do you understand that the allegations in  
14 this lawsuit relate to catastrophic failure?

15 MR. BOURNE: Object to the form. You can  
16 answer the question.

17 THE WITNESS: I have seen that in documents,  
18 yes.

19 BY MS. LINDAHL:

20 Q. But your opinion is not limited to  
21 catastrophic failure only?

22 A. My opinion is analyzing failures due to  
23 overheating, which would almost always be catastrophic  
24 failure.

25 Q. In that paragraph three, subparagraph three,

1 where you state the Cree LED lamps will commonly  
2 experience failure in advance of the advertised product  
3 life; is it your opinion that every Cree LED lamp will  
4 fail in less than one year?

5 A. No.

6 Q. What percentage of Cree LED lamps do you  
7 believe will fail in less than one year?

8 A. That is not possible to ascertain from  
9 measurements on lamps that are performing. That number  
10 would have to be ascertained from life testing a very  
11 large number of lamps for a very long time.

12 Q. And you did not life test a very large number  
13 of lamps for a long number -- for a long amount of time  
14 for the purpose of this report. Correct?

15 A. Correct.

16 Q. Can you quantify for me in any way, what  
17 percentage of Cree LED lamps you opine will fail within  
18 one year?

19 A. Again, that is not possible from the type of  
20 analysis that I was asked to do.

21 Q. Can you, please, describe for me the  
22 instructions that you were given with respect to your  
23 assignment on this expert engagement?

24 A. They were very straightforward. Are there  
25 common elements in each of the Cree lamps, which are

1 higher than comparable competitive lamps, and higher  
2 than a customer expectation.

3 Q. Do you have an opinion, sitting here today,  
4 what the -- excuse me, comparable competitor lamps would  
5 be against which you are comparing the failure rate to  
6 make a determination that it is abnormally high?

7 A. An estimate of what? About the competitive  
8 lamps?

9 Q. Do you have an understanding of what the  
10 competitor lamps are?

11 A. Yes.

12 Q. Which lamps do you consider to be competitor  
13 lamps to the Cree consumer LED lamps?

14 A. They are revealed in the report. They were  
15 contemporaneous LED lamps from major manufacturers.

16 Q. And are you referring to the GE and Philips  
17 lamps that you describe in your report?

18 A. Yes.

19 Q. Do you know what the overall failure rate of  
20 those lamps is?

21 A. No.

22 Q. Were you provided any information at all about  
23 the overall failure rate of Cree lamps during the period  
24 2013 to today?

25 A. No.



1 Q. Do you think that would be something that  
2 would be helpful for you to know in reaching opinions in  
3 this case?

4 A. Not at all.

5 Q. You -- if you knew, for example, that the  
6 overall failure rate of Cree LED lamps, between 2013 and  
7 today, was less than two percent, that would not affect  
8 your opinions?

9 A. No.

10 MR. BOURNE: Objection; form.

11 BY MS. LINDAHL:

12 Q. Why not?

13 A. It is misleading.

14 Q. Why is it misleading?

15 A. We are -- the subject of this investigation is  
16 the early product, volumes ramped up considerably from  
17 2013 to 2015 to today, so, a volume average over that  
18 length of time would not indicate anything to me about  
19 the failures of the early lamp types.

20 Q. What information are you relying upon to  
21 determine the volume has ramped up considerably between  
22 2013 and today?

23 A. There are reports by US Department of Energy  
24 and industry reports showing volumes, prices, even  
25 breakdowns by lamp type that I have been very familiar

1 with every year.

2 Q. Are those reports that you just testified  
3 about cited in your report in any space -- any places?

4 A. No.

5 Q. Your opinion in paragraph three, subparagraph  
6 three, that Cree LED lamps will commonly experience  
7 failure in advance of the advertised product life of  
8 less than a year --

9 A. That is not what it says, I'm sorry.

10 Q. Okay. What does it say?

11 A. Commonly experience failure in advance of  
12 advertised product life, which will have some number,  
13 parentheses, less than one year, meaning that some will  
14 fail in less than one year.

15 Q. Okay. But you cannot quantify that number for  
16 me?

17 A. Of course not.

18 Q. But the lamps that you are referring to in  
19 that opinion, paragraph three, subparagraph three, those  
20 are lamps that have been manufactured and sold since  
21 2013. Correct?

22 A. As far as I know.

23 Q. And so there has been six years of performance  
24 data on those lamps. Correct?

25 A. No.

1 Q. For the lamps that were manufactured and sold  
2 in 2013?

3 A. Those lamps have been superseded by more  
4 modern versions.

5 Q. Well, but the lamps that were sold in 2013,  
6 there has been six years of performance data for those  
7 lamps, even though newer versions might have come out in  
8 subsequent years, correct?

9 A. I don't know what performance data means.

10 Q. All right. Those lamps have been sold to  
11 consumers since 2013. Correct?

12 A. Yes.

13 Q. So some consumers may have purchased those  
14 lamps in 2013?

15 A. Yes.

16 Q. And had those lamps in operation in their  
17 homes for six years. Correct?

18 A. Possible.

19 Q. So it is possible that some lamps have been  
20 performing -- have been in operation for at least six  
21 years. Correct?

22 A. It is possible.

23 Q. And that is not information that you  
24 considered in any way in forming your opinions, is it?

25 A. It would be irrelevant.

1           Q.    How can the actual performance data of a lamp  
2   be irrelevant to an opinion about the expected failure  
3   rate of a lamp?

4           A.    I --

5           MR. BOURNE:  Objection; form.

6           THE WITNESS:  I'm not opining on the  
7   probability that any single lamp fails.  I'm  
8   opining on the design of the lamp, and the  
9   probability of failure of a large population of  
10  lamps.

11  BY MS. LINDAHL:

12           Q.    So your opinion, though, is -- your opinion is  
13  based on how you expect a lamp to perform in the future.  
14  Correct?

15           A.    No.

16           Q.    How is it not -- how is the opinion that LED  
17  lamps will commonly experience failure in advance of the  
18  advertised product life, not a prediction of how a lamp  
19  will perform in the future?

20           A.    The distinction is between an individual lamp,  
21  run by an individual consumer, which is the sort of  
22  question you are asking, for a certain period of time.  
23  I cannot opine on whether or not that lamp will fail or  
24  when.  But given the entire population, I can certainly  
25  opine on how likely those lamps are to fail, relative to

1 some benchmark, which are other lamps, and customer  
2 expectations.

3 Q. Okay. Can you explain for me what you mean by  
4 customer expectations?

5 A. Simply what is written on the labels of the  
6 lamps.

7 Q. And are you -- just so I'm clear, are you  
8 giving an opinion in this report about customer  
9 expectations --

10 A. No, not at all.

11 Q. -- and longevity?

12 A. Not at all.

13 Q. Okay. What experience do you have that would  
14 allow you to evaluate customer expectations?

15 A. I'm not opining on that.

16 Q. I understand that you are not opining on that,  
17 but what experience do you have that would allow you to  
18 have a belief or understanding about customer  
19 expectations of the longevity of LED lamps?

20 A. I don't think that is relevant to my  
21 testimony.

22 Q. Okay. I believe you testified a few moments  
23 ago about the failure rates of competitor lamps.  
24 Correct?

25 A. No.

1 those line items were packaging exhibits only that were  
2 not introduced to the market as product. Eliminating  
3 those 13, I had 30 line items, backed by exhibits,  
4 pertaining to distinct LED products.

5 Q. So the list of bulbs that is included in table  
6 two, is some portion of a list of bulbs that was  
7 provided to you by counsel. Correct?

8 A. Yes.

9 Q. Did you do any separate evaluation of Cree's  
10 consumer bulb product lines to determine whether this  
11 list was complete or accurate?

12 A. That would seem to be irrelevant.

13 Q. Is -- are your opinions in this case limited  
14 only to the bulb types that are listed in table two?

15 A. Yes.

16 Q. Are you -- and you are aware that Cree has  
17 other bulb types such as, for example, candelabras?

18 A. Yes.

19 Q. And you are not offering any opinions with  
20 respect to candelabras. Correct?

21 A. Correct.

22 Q. Are you offering any opinions in this case  
23 with respect to par38s?

24 A. No.

25 Q. Are you offering any opinions in this case

1 with respect to down lights?

2 A. No.

3 Q. Are you offering any opinions in this case  
4 with respect to can -- recessed can lights?

5 A. No.

6 Q. Are you offering any opinions in this case  
7 with respect to A-type bulbs; you know what I'm  
8 referring to when I say A-type bulbs?

9 A. Yes.

10 Q. Are you offering any opinion in this case that  
11 refer to A-type bulbs in wattages other than what is  
12 listed in this table?

13 A. No.

14 Q. Same question for BR30s, are you offering any  
15 opinion in this case with respect to BR30s that have  
16 different wattages than what is listed in this table?

17 A. No.

18 Q. In table three you list seven Cree LED lamp  
19 designs; do you see that?

20 A. Yes.

21 Q. And you state above table three, you say that  
22 the list in table two has been reduced from 30 Cree LED  
23 lamps, to a list of seven Cree LED lamp designs in table  
24 three below; do you see that?

25 A. Yes.

1           Q.    And you explain in paragraph 14 that what you  
2   were intending or how -- what the process was of  
3   reducing the list of 30 to seven.   Correct?

4           A.    Yes.

5           Q.    Can you, please, explain that process?

6           A.    So the list of 30 are unique MPNs or  
7   manufacturing product numbers, I believe is what MPN  
8   stands for per Cree's terminology, identifying  
9   internally to Cree, unique identifiers for different  
10  lamp types.   Those identifiers include things as listed  
11  at the bottom of page eight, bulb shape, lamp  
12  architecture, whether it is a filament tower or 4flow  
13  for example, lumens wattage, the LED wattage, and the  
14  rate of lifetime.

15                   Most of those attributes -- most of the  
16  attributes listed at the bottom of page eight, are  
17  related to the thermal design, so how many watts are  
18  there, what is the architectural shape of it, and so on.  
19  And so categorizing the Cree products, based on  
20  attributes that impact the thermal design, and  
21  identifying which line items out of the 30 would have  
22  identical thermal elements that is containing the same  
23  heat sink, the same bulb shape, the same size, and  
24  therefore would have the same thermal design, can be  
25  considered to be thermally equivalent.



1           So, for example, an A19 bulb, operating at  
2   9.5 watts, putting out 5,000-degree Kelvin temperature  
3   or 2700-degree Kelvin temperature will have very nearly  
4   the same thermal response. The LEDs will be slightly  
5   different efficacy for the different color temperatures  
6   with very minimal impact on thermals.

7           So I was able to reduce the very large number  
8   of lamp types, 30, down into seven lamp types  
9   representing those 30 based on their thermal  
10  characteristics.

11          Q.   Are there any industry standards or guidelines  
12  that inform the process that you used to reduce the 30  
13  lamps to the list of seven lamp types?

14          A.   Not that I know of.

15          Q.   I believe you testified earlier that bulbs  
16  that were manufactured in 2013 would have been  
17  superseded by newer bulbs; do you recall that testimony?

18          A.   Yes.

19          Q.   Can you explain what you meant by that?

20          A.   For example, the filament thermal lamp, which  
21  appeared to be the initial introduction into the A-line,  
22  was then -- superseded may not be the right word, in  
23  that I don't know that the 4flow completely replaced the  
24  filament tower from Cree's manufacturer, but it was an  
25  advanced design. The 4flow relevant to the filament

1 tower.

2 The filament tower and the 4flow were then  
3 subsequently replaced by LED designs that have no  
4 apparent heat sink. They look like a standard  
5 incandescent light bulb. Virtually all manufacturers in  
6 the industry have gone to that more modern type, A19.  
7 So Cree's manufacturing now is that modern A19, like  
8 all -- virtually all other LED manufacturers, which in  
9 my terminology would have superseded the prior designs,  
10 the filament tower, and the 4flow.

11 Q. Is it accurate or fair to say that by the term  
12 superseded, you are referring to different or newer  
13 generations of bulb types?

14 A. That is right.

15 Q. And by reason of your experience as an  
16 employee of General Electric or GE Lighting, you are  
17 aware that LED technology has consistently improved  
18 since 2013. Correct?

19 A. Yes.

20 Q. And so, for example, bulbs that were  
21 manufactured in 2013, likely have design differences  
22 from bulbs that are manufactured today?

23 A. Yes.

24 Q. And that is true with a -- even though you are  
25 looking at bulbs by the same manufacturer. Correct?

1 A. Yes.

2 Q. Are those changes in design, and improvements  
3 in LED technologies something that you took in  
4 consideration in forming your opinions in any way?

5 A. Yes.

6 Q. How so?

7 A. When the initial LED lamps were introduced to  
8 the market, thermal management was an extreme challenge.  
9 So LED thermal capabilities have improved over time, we  
10 can now run LEDs hotter than we could back then, and  
11 LEDs have become much more efficient now than they were  
12 back then. So when operating, they produce less heat  
13 than they did back then.

14 So both from the LED susceptibility side, more  
15 susceptible than they are now, and also from the thermal  
16 management challenge, much higher thermal load back then  
17 than now; yes, there are significant differences.

18 Q. Did you -- looking back again at table two,  
19 did you do any analysis into whether the bulbs contained  
20 on table two -- or in table two, are a complete listing  
21 of the various generations of Cree bulbs?

22 A. Would you repeat that, please.

23 Q. Sure. On table two -- the bulbs in table two  
24 were provided by counsel. Correct?

25 A. Yes.

1 Q. Did you do any analysis of whether the lamps  
2 contained in table two are a complete listing of each  
3 generation of Cree bulbs?

4 A. I'm sorry, I don't know what that means.

5 Q. Did you do any analysis of the list of lamps  
6 that was provided to you in list of table two to  
7 determine whether it contains every generation of Cree  
8 bulb?

9 A. Every generation?

10 Q. Yes.

11 A. Meaning from the first filament launched to  
12 the modern no heat sink bulbs?

13 Q. Yes. Correct.

14 A. No.

15 MS. LINDAHL: I'm at a good stopping point if  
16 we can take a ten-minute break.

17 THE VIDEOGRAPHER: This is the end of media  
18 unit one. We are now going off the record. The  
19 time on the video monitor is 10:58 a.m.

20 (Off the record.)

21 THE VIDEOGRAPHER: We are back on the record.  
22 This is the beginning of media unit number two.

23 The time on the video monitor is 11:12 a.m.

24 BY MS. LINDAHL:

25 Q. All right. Dr. Allen, can you, please, look

1 Q. My question is whether there is any literature  
2 or industry guidance that you could point me to that  
3 supports that conclusion?

4 A. That supports one to two-degree C conclusion.

5 Q. Correct.

6 A. No.

7 Q. Is it your opinion that the Cree consumer  
8 bulbs that have been manufactured since 2013 are  
9 sufficiently similar that they could be evaluated  
10 together, so to speak?

11 MR. BOURNE: Object to the form.

12 BY MS. LINDAHL:

13 Q. Do you understand what I'm trying to get at?

14 A. I would like you to repeat it, please.

15 Q. Sure, is it your opinion that the Cree  
16 consumer bulbs that have been manufactured since 2013  
17 are sufficiently similar that their thermal performance  
18 can be evaluated as a group?

19 MR. BOURNE: Same objection. You can answer.

20 THE WITNESS: Yeah, that is overly broad. If  
21 we are looking at all seven lamp types, no, they  
22 are different from thermal performance of each  
23 other.

24 BY MS. LINDAHL:

25 Q. Okay. But within each lamp type, is it your

1 opinion that every generation of lamp can be evaluated  
2 together?

3 A. No.

4 Q. Okay. Which generations of the A19 should be  
5 evaluated separately?

6 A. The list of seven lamps represent  
7 differentiation among generations.

8 Q. Okay. You state in paragraph 14 that all  
9 duplicates share the following attributes with their  
10 respective Cree LED lamp design; do you see that?

11 A. Yes.

12 Q. When you were reaching the conclusions set  
13 forth in paragraph 14, did you do any analysis of the  
14 various bills of material of the Cree consumer bulbs?

15 A. Limited.

16 Q. Can you describe that analysis, please?

17 A. I was primarily looking for number of LEDs,  
18 and type of LED.

19 Q. Did the number of LEDs that -- well, let me  
20 ask another question first; do you recall which bills of  
21 material you reviewed?

22 A. I believe that I had bill of material for most  
23 of those seven lamps in table three, except for the BR30  
24 lamp.

25 Q. Do you recall -- when you said you reviewed

1           Q.    Did LED count and type affect your opinions  
2   about the longevity or expected longevity of Cree  
3   consumer bulbs?

4           A.    Yes.

5           Q.    How so?

6           A.    In particular, in order to know the junction  
7   temperature which -- of the LED, which can't be  
8   measured, the standard procedure and recommended by Cree  
9   is to measure the temperature adjacent to the LED and to  
10   calculate the junction temperature based on the thermal  
11   resistance of the LED, so I need to know the LED type,  
12   and based on the power flowing, whereby I need to know  
13   how many LEDs are receiving that power.

14          Q.    Did you do any analysis of any bills of  
15   material to determine whether Cree consumer bulbs used  
16   the same components across generations of other LEDs?

17          A.    I'm not analyzing across generations.

18          Q.    Okay. So, my question was, though, whether  
19   you reviewed any bills of material to determine whether  
20   Cree consumer bulbs used different components across  
21   generations?

22          A.    I'm not interested.

23          Q.    So is your answer no?

24          A.    It is irrelevant to my testimony.

25          Q.    Respectfully --

1 A. It would.

2 Q. Could you answer the question?

3 A. I understand. Could you repeat it again,  
4 please, and I will.

5 Q. Sure. Did you do any analysis of bills of  
6 material to determine whether the components that were  
7 used in Cree consumer bulbs were the same across  
8 generations?

9 A. I don't know that I had access to BOMs for  
10 other generations.

11 Q. Okay. It is a yes or no question -- did  
12 you --

13 A. I don't believe so. I'm sorry.

14 Q. Okay. Do you have -- do you know about how  
15 many Cree -- how many consumer bulbs Cree has sold since  
16 introduction of the first generation of the A19?

17 A. I don't.

18 Q. Do you know by reason of your employment with  
19 General Electric or GE Lighting, do you know about how  
20 many consumer LED bulbs GE sold between 2013 and the  
21 date upon which --

22 A. I don't.

23 Q. Do you have any sense of the scale, for  
24 example, is it a million, or tens of millions?

25 A. I don't, but it is something that I can



1           Q.    And my question is, just how many bulbs did  
2   you physically inspect before you issued your opinion in  
3   this case?

4           A.    I would have to estimate, I did not count, but  
5   per reported there were five different bulb types  
6   measured. In each bulb type there was an intact bulb,  
7   which I did not attempt to tear down, and there was at  
8   least one teardown bulb of each type, and so there were  
9   at least two, typically three different bulbs measured  
10  for each of the five bulb types; and then each  
11  measurement on each light bulb was repeated two to five  
12  times and averages were taken.

13          Q.    My question is perhaps a little bit more basic  
14  than that, you physically inspected some lamps in order  
15  to form an opinion in this case. Correct?

16          A.    Yes.

17          Q.    How many?

18          A.    I said I don't know the count. I laid out an  
19  estimate, which would have totaled more than ten.

20                A minimum of ten.

21          Q.    Where in your report could I look to determine  
22  how many bulbs you physically inspected before reaching  
23  your opinion in this case?

24          A.    The summary as I just paraphrased is that  
25  there were five lamp types, in each of the five types

1     there was an intact lamp and at least one teardown lamp  
2     that would constitute a minimum of ten lamps that were  
3     physically measured.

4             Q.     What page of your report should I look at to  
5     determine how many bulbs you physically inspected before  
6     reaching an opinion in this matter?

7             MR. BOURNE:   Object to the form.   You can  
8     answer.

9             THE WITNESS:   It would take me some time to  
10    find it potentially.

11    BY MS. LINDAHL:

12             Q.     Please take your time.

13             A.     But I'm certain -- I'm certain that there is  
14    an explanation in the report that says that for each  
15    lamp type, five lamp types, there is an intact bulb and  
16    a teardown bulb, both of which were measured for  
17    thermals and dimensions.   In the teardown bulb case, in  
18    some cases, more than one lamp was measured.   And so  
19    there would have been a minimum of ten.

20             For each of the lamps measured, the raw data  
21    is provided in the appendix, and so one could page  
22    through the appendix and find how many individual lamps  
23    were measured.

24             Q.     Can you look at page 54 of your report?

25             A.     Okay.

1           Q.    Is this the appendix about which you just  
2 testified?

3           A.    Yes.

4           Q.    So appendix two sets out how many lamps you  
5 physically inspected before reaching an opinion in this  
6 case?

7           A.    It could.

8           Q.    Can you just page through it and confirm that  
9 it does?

10          A.    That would take me quite a while to confirm  
11 that I have a page in here for each of those at least  
12 ten lamps.

13          Q.    Please take your time. We are here to get it  
14 right today, so...

15          A.    So starting with the BA21 on page 61 is the  
16 intact lamp. On page 63 is it teardown lamp. Several  
17 pages of the teardown lamp in various teardown  
18 scenarios, meaning different parts removed for access.

19                On page 68 begins the FT9.5. On page 70 are  
20 shown both the teardown and the intact lamp. On page 71  
21 the teardown is obvious as being partially disassembled  
22 on the left. So we have two lamps in the FT9.5.

23                On page 76 is shown the FT6, it is the  
24 filament tube 40 watt version, teardown lamp on the  
25 left, intact lamp on the right, so two there, that is a

1 count of six.

2 On page 89 you see the 4flow 60-watt design,  
3 the teardown on the left, intact lamp on the right. Two  
4 lamps, so the count is up to eight.

5 On page 96 is the intact lamp for the BR30,  
6 and on page 98 is the teardown lamp for the BR30, so the  
7 count would be up to ten.

8 Q. So you physically inspected ten Cree lamps  
9 before you reached an opinion in this case?

10 A. No, I've shown the detailed data for ten, and  
11 so there may have been other lamps that I tested that  
12 failed. For example, in one of the reports I  
13 mentioned -- somewhere in the report I mentioned a BA21  
14 lamp that I started testing and it would not relight, so  
15 I had to start with a new teardown lamp in that case.  
16 So that is why I say a minimum. There ended up being  
17 ten in the analysis, there were a few more than ten that  
18 actually got tested.

19 Q. How many more than ten were actually tested?

20 A. At least that one.

21 Q. Was it more than one?

22 A. Not that I recall.

23 Q. Where would I look in your report to be able  
24 to know whether you tested additional lamps that are not  
25 included in the report?

1           A.    I'm not relying on testing of any additional  
2   lamps in the report.

3           Q.    So just to be clear, you believe there was  
4   only one additional lamp that you tested that was not  
5   included in your report?

6           A.    What I needed was one intact lamp, one  
7   teardown lamp for each type to compare, and I recall at  
8   least one lamp failing in the process, which I had to  
9   replace.

10          Q.    But sitting here today, you cannot tell me  
11   whether you tested other lamps that are not included in  
12   your report?

13          A.    I would have to ask what you mean by test.

14          Q.    What do you mean by test; what does it mean to  
15   you?

16          A.    I mean taking well-controlled temperature  
17   measurements or physical dimensional measurements and  
18   analyzing them.

19          Q.    So using that definition, can you tell me,  
20   sitting here today, whether you tested any additional  
21   lamps other than that one A21 that are not included in  
22   your report?

23          A.    Per the definition I just gave of testing, no,  
24   no others.

25          Q.    No, there are no others, or no, you cannot

1 tell --

2 A. No, there are no others.

3 Q. Okay. Where -- how did you obtain the lamps  
4 that you tested that are included in your report?

5 A. I think possibly all of them through online  
6 vendors.

7 Q. Which online vendors?

8 A. Various. So, Amazon was one, a distributor  
9 known as 1000bulbs.com was one that I recall. These  
10 lamps that are obsolete are very hard to find, even the  
11 distributors of current lamps like Amazon or 1000Bulbs  
12 tend not to have them. I found at least one through an  
13 eBay seller, so there were at least three different  
14 sources.

15 Q. Can you tell me which lamp reflected in your  
16 report you purchased on eBay?

17 A. I have record of it, but it is not in my  
18 report, but I do not recall.

19 Q. And what types of records do you have that  
20 would reflect where you obtained these?

21 A. Invoices.

22 Q. Is that something that you provided to counsel  
23 in connection with your report?

24 A. I provided line item expense report.

25 Q. Okay. How many lamps did you purchase -- how

1 Q. -- the ambient temperature at the time of the  
2 test. Correct?

3 A. Yes.

4 Q. Is the ambient temperature in your lab  
5 consistent from day-to-day?

6 A. It varied from 22 to 23 degrees C each time I  
7 measured.

8 Q. My question isn't when you measured, my  
9 question is: At times when you are not performing tests  
10 in your lab, what is the ambient temperature?

11 A. It would not be different.

12 Q. Did counsel provide you with any physical  
13 samples of bulbs?

14 A. Not that I recall.

15 Q. Do you recall when you purchased these bulbs?

16 A. I have record.

17 Q. Okay. Sitting here today, though, do you  
18 recall when they were purchased?

19 A. Roughly.

20 Q. And when were they purchased?

21 A. As I recall, beginning, roughly, the last week  
22 of October.

23 Q. Okay. Did you receive some bulbs directly  
24 from my law firm to your lab?

25 A. Yes.

1 Q. Did you test those bulbs?

2 A. I don't know if it was from your law firm.

3 Q. Okay.

4 A. It was upon request to Cree. They were not  
5 the bulbs requested, so I did not test them.

6 Q. Where are those bulbs now?

7 A. In the lab.

8 Q. You described earlier that the test that you  
9 conducted included an analysis of an intact bulb and an  
10 analysis of a teardown bulb. Correct?

11 A. Yes.

12 Q. Did you take into consideration -- well, let  
13 me ask a background question first.

14 Can you describe, please, first the process of  
15 tearing down a bulb for testing?

16 A. It is a bit different for each bulb type. I  
17 need to gain access to the LEDs both line of sight, and  
18 physical access, and so in each case I'll need to remove  
19 a bulb, either a glass bulb or a plastic bulb. That  
20 gives me access to the LEDs, and to what we call the  
21 printed circuit board, on which the LEDs are mounted.

22 I then, if possible, need to get another layer  
23 down by removing the printed circuit board and the LEDs  
24 in lamps where that is possible, in order to get to the  
25 electronic circuit below, so that I could make



1 word bulb when I meant lamp.

2 A. I understand.

3 Q. And I think maybe we both have been doing it.  
4 Okay. Have there been any questions that I asked of you  
5 that were unclear because I used the word bulb instead  
6 of lamp?

7 A. They weren't unclear, it may be possible I  
8 answered the wrong question, but I'm assuming that when  
9 you said bulb, you mean the light bulb, which I would  
10 refer -- in the industry it is referred to as a lamp.  
11 That is my assumption.

12 Q. Okay.

13 A. We are only just now beginning to discuss bulb  
14 in terms of the globe --

15 Q. Correct.

16 A. -- that surrounds the LEDs.

17 Q. Okay. And going forward, if I ask you a  
18 question, and it appears to you that I used the word  
19 bulb instead of lamp, will you correct me so we can make  
20 sure that you are answering the correct question?

21 A. I'll try.

22 Q. So going back to the question I asked a moment  
23 ago, can you point me to where in your report where I  
24 would find the analysis of the impact of thermal  
25 management of the teardown of the lamp?

1           A.     Okay.

2                     If we go to page 60, it should be for the  
3     BA19, the 100-watt three-way operated at 100-watt  
4     setting. And at the bottom of page 60 there is a table  
5     showing a summary. The left several columns are  
6     measurements of the teardown bulbs, and the right three  
7     columns are measurements of the intact bulb. Each  
8     column is referenced by an image number, which is an  
9     infrared camera unique number.

10                    So each of the columns is a repeated  
11     measurement on that particular lamp, each measurement  
12     fully warmed up, and so the measurements are expected to  
13     be similar across a row.

14                    The heat sink temperature measurement for the  
15     teardown bulb shows 89 degrees, 90, 89, 90, 86, the  
16     average 89. For the intact bulb, one measurement 89  
17     agreed with the average heat sink.

18            Q.     I'm sorry. Continue.

19            A.     So in that case the averages are exactly the  
20     same. That is not always the case. What I'm looking  
21     for is a red flag, is there any reason why the teardown  
22     lamp is significantly different than the intact lamp.  
23     If so, and I don't recall ever finding such a  
24     discrepancy, the reason to be looking is, if so, then I  
25     need to be more rigorous on the measurement of the

1     teardown lamp.

2           Q.    Is it possible that tearing down a lamp breaks  
3     thermal interface materials that thermally connect  
4     different parts of the system?

5           A.    Only in one case.

6           Q.    You are saying that happened in one case in  
7     this report?

8           A.    No, it would have been possible in one case.

9           Q.    Okay. Which lamp?

10          A.    There was only one of these lamps that --  
11     where I found a thermal interface material between the  
12     LEDs and heat sink.

13          Q.    And which lamp was that?

14          A.    That was the BR30.

15          Q.    Okay. You mentioned on page 60 -- while we  
16     are there, with respect to the teardown lamp, you state  
17     teardown lamp no longer operable, will try to debug. Do  
18     you see that?

19          A.    Yes.

20          Q.    What did you mean by that?

21          A.    To try to operate it again.

22          Q.    And were you able to operate it again?

23          A.    What page is that on?

24          Q.    Page 60, where we just were.

25          A.    My notes appear to say that I continued using

1 Q. Did you preserve or keep this exploratory data  
2 that you captured?

3 A. No.

4 Q. As part of your analysis in this case, were  
5 you provided any test results that Cree obtained during  
6 its ongoing reliability testing of consumer LED bulbs?

7 A. Yes.

8 Q. And did that reliability testing -- or excuse  
9 me, did those reliability test results affect your  
10 opinions in any way?

11 A. We should back up to define reliability  
12 testing.

13 Q. Sure, how would you define it?

14 A. I don't believe I had access to lamp failures,  
15 but I had access to lamp temperatures.

16 Q. What do you mean by you did not have access to  
17 lamp failures?

18 A. I said I don't recall having access to lamp  
19 failures. I certainly was not focusing on lamp  
20 failures. And I don't recall, for example, out of some  
21 number of lamps on some lamp types how many failures  
22 there were.

23 Q. When you say you did not have access to lamp  
24 failures, what type of data or report would you have  
25 expected to see with respect to lamp failures?

1           A.    I saw Energy Star reports of some of the lamp  
2   types with lumen maintenance, and color shifts recorded  
3   at zero hours -- not lumen maintenance, but lumen  
4   maintenance, and color shift at 3,000 hours, and  
5   6,000 hours relative to zero hours.

6                   I don't recall seeing in any of those reports  
7   a fail to start lamp. I do recall seeing lumen  
8   maintenance that fell below the minimum acceptable, and  
9   I do recall seeing color shifts exceeding the maximum  
10   acceptable. So they could have been considered to be  
11   failures against Energy Star, but perhaps not a  
12   catastrophic failure.

13           Q.   And do you have an understanding of whether  
14   the claims in this case relate to failures related to  
15   lumen maintenance or chromaticity shift?

16           A.   I don't recall differentiating.

17           Q.   I guess let me ask it a different way, do you  
18   understand what it is that the plaintiff has accused --  
19   or what the allegations are that the plaintiff has made  
20   against Cree?

21           A.   I believe so.

22           Q.   And what is your understanding of what the  
23   plaintiff's claims are against Cree?

24           A.   That the lamp fails to operate in a time less  
25   than the advertised time.

1 not trying to quantify failure rates at all. I'm trying  
2 to quantify the extent to which certain lamps may be  
3 overheated relative to the capability of their  
4 components to meet their rated lifetime.

5 Q. You -- if you can turn with me to your  
6 report -- do you still have your report in front of you,  
7 Exhibit 2?

8 A. Yes.

9 Q. Can you turn with me to paragraph 44 -- and  
10 I'll give you a page number, so that paragraph begins on  
11 page 30 and continues on to page 31.

12 A. Okay. I'm sorry, page again, 44?

13 Q. 30 and 31, it is paragraph 44.

14 A. Okay. Sorry.

15 Q. And specifically I'm going to have you look at  
16 paragraph 44E, but you should look at the entire  
17 paragraph, and take as much time as you need.

18 A. Okay.

19 Q. You state in paragraph 44E, you make a  
20 reference to very high failure rate in customer rates;  
21 do you see that?

22 A. Yes.

23 Q. Do you have an understanding of what the  
24 failure rate of Cree consumer bulbs is between 2013 and  
25 today?

1 A. Not in a quantitative sense.

2 Q. Well, do you have any sense of what the  
3 failure rate of Cree LED bulbs is between 2013 and  
4 today?

5 A. I'm inferring that it must be significantly  
6 high or we would not have this case, so I'm looking for  
7 temperatures that would predict a high failure rate.

8 Q. Were you provided any information about the  
9 failure rate of Cree consumer LED bulbs --

10 A. No.

11 Q. -- between 2013 and today?

12 A. I'm sorry, I answered early. No.

13 Q. So when you are referring to very high failure  
14 rates in customer use in paragraph 44E, is it accurate  
15 to say that that was an assumption?

16 A. Yes.

17 Q. Was that assumption provided to you by  
18 counsel?

19 A. No. Let me clarify.

20 Q. Sure.

21 A. That assumption was not provided  
22 quantitatively in any way. Again, it is an inference  
23 that these lamps have been failing in customer use at  
24 unexpectedly high rates.

25 Q. What would you consider to be the bottom

1 bulbs that are identified in your report?

2 MR. BOURNE: Object to the form?

3 THE WITNESS: But I believe I can answer.

4 MR. BOURNE: Yeah, you can answer.

5 THE WITNESS: These lamps were designed and  
6 released in a specific period of time that  
7 characterizes the state of the art for LED lamps at  
8 that time. Cree may have been selling those lamps  
9 for any number of years after the design was  
10 created.

11 BY MS. LINDAHL:

12 Q. What is that specific period of time that you  
13 just referenced?

14 A. I don't know the period of time over which  
15 these lamps were manufactured. For each of the lamps  
16 that I tested I provided the manufacturing date code for  
17 that particular lamp.

18 Q. And it is your opinion that those -- that the  
19 bulbs that you reviewed and analyzed will fail  
20 prematurely in less than one year. Correct?

21 A. Not any given individual lamp, but a  
22 population of lamps.

23 Q. And you have identified, for example -- can  
24 you look at page 84?

25 A. Okay.



1 Q. And this an example, is it not, where you give  
2 the date code of a particular lamp that you analyzed?

3 A. Yes.

4 Q. And the date code of that lamp is the third  
5 week of 2016?

6 A. Yes, my interpretation of the date code.

7 Q. So that would be three years ago. Correct?

8 A. Three plus.

9 Q. So your opinion would be that some unspecified  
10 percentage of these lamps would have failed before the  
11 third week of 2017. Correct?

12 A. The third week of 2016, to correct your  
13 statement, which was 2017.

14 Q. Well, I'm asking about one year from this date  
15 code?

16 A. Oh, I see, I see, thanks for clarifying. If I  
17 go back to the paragraph that you are referencing with  
18 the less than one, the Cree LED lamps in subparagraph  
19 three of paragraph three, the Cree LED lamps are  
20 referring generically to all of these different types of  
21 lamps above. I'm making a blanket statement that these  
22 Cree lamps will commonly experience failure in advance  
23 of the advertised product life. In parentheses, less  
24 than one year, perhaps should have been better defined  
25 in this sentence. What I told you verbally is that my

1 MR. BOURNE: Objection; foundation.

2 THE WITNESS: I'm not aware of any such data,  
3 and I did not have access to any such data.

4 BY MS. LINDAHL:

5 Q. Did you not think that it was important to  
6 confirm your opinion that Cree LED lamps would commonly  
7 fail within one year?

8 MR. BOURNE: Objection; misstates his  
9 testimony.

10 THE WITNESS: Would you repeat it, please, I  
11 want to make sure.

12 BY MS. LINDAHL:

13 Q. Yeah, did you not think that it was important  
14 to confirm your opinion that Cree LED lamps would  
15 commonly experience failure in less than one year?

16 A. No, that is not what I said. That is  
17 parenthetical. What I said is that they would commonly  
18 experience failure in advance of the advertised product  
19 life.

20 Q. Okay. Well, did you do anything to confirm,  
21 that your opinion, that Cree LED lamps would commonly  
22 experience failure in advance of the advertised product  
23 life?

24 A. Yes, that is the essence of the report.

25 Q. Did you look at any actual failure data to

1 confirm that opinion?

2 A. Failure data is statistical data for which I  
3 would need a very large sample size that was not  
4 available to me.

5 Q. Let me rephrase, did you look at any actual  
6 return or warranty claim data to confirm your opinion?

7 A. I did not.

8 Q. Can you please -- well, and just before we  
9 move on, you referenced that the bulb that I showed  
10 you -- directed you a few minutes ago performed -- and  
11 I'm paraphrasing, but performed better than some of the  
12 other bulbs that you evaluated. Correct?

13 A. Less hot, less overheated.

14 Q. Okay. Does the -- is it your opinion that  
15 the -- well, let me ask it differently.

16 Did the 4flow have better thermal performance  
17 than what you call the FT19?

18 A. Marginally better.

19 Q. Can you look at page 69?

20 A. Okay.

21 Q. And page 69 is -- includes an image of an FT19  
22 bulb. Correct?

23 A. Well, that is -- yes, yes, it is.

24 Q. And you list the manufacturing date code for  
25 that bulb. Correct?

1 A. Yes.

2 Q. And that date code is listed as the 49th week  
3 of 2013. Correct?

4 A. Yes.

5 Q. Which is December of 2013. Correct?

6 A. Yes.

7 Q. And so that is -- it is currently January of  
8 2020. Correct?

9 A. Yes.

10 Q. So it has been six years since those bulbs  
11 have been manufactured. Correct?

12 A. Yes.

13 Q. And you did not look at any actual return or  
14 warranty data for these FT19 bulbs that were  
15 manufactured in 2013. Correct?

16 A. I did not.

17 Q. Okay.

18 Let's look at paragraph 24, which is on page  
19 18?

20 A. Okay.

21 Q. You have a sentence in paragraph 24 that is  
22 underlined that states, accordingly I'm able to conclude  
23 that it is high temperatures, and not these other  
24 potential failure mechanisms that causes the LED lamps  
25 to fail; did I read that accurately?

1 three, subparagraph two.

2 A. Okay.

3 Q. You state, the Cree LED lamps share a common  
4 defect, they operate too hot and because of this will  
5 experience premature failure; did I read that  
6 accurately?

7 A. Yes.

8 Q. Is that your opinion?

9 A. Yes.

10 Q. Are you able to quantify for me today -- well,  
11 is it your opinion that every Cree LED will experience  
12 premature failure?

13 A. No.

14 Q. Are you able to quantify for me, sitting here  
15 today, what percentage of Cree LED lamps will experience  
16 premature failure?

17 A. I answered that question several times, it  
18 does not change.

19 Q. Well, I believe you answered that question  
20 earlier today with paragraph three, subparagraph three;  
21 so my question was about paragraph three -- the opinion  
22 expressed in paragraph three, subparagraph two; so just  
23 confirming your testimony is unchanged whether we are  
24 looking at paragraph three, three, or three, two?

25 A. Unchanged.

1 Q. Okay.

2 You -- I believe you testified earlier today  
3 that you did not review the declaration of Scott Schwab?

4 A. Correct.

5 Q. Did anyone -- regardless of whether you  
6 reviewed his declaration, did counsel or anyone tell you  
7 that Mr. Schwab included in his declaration that the  
8 failure of Cree consumer bulbs was consistently less  
9 than two percent?

10 A. They did not, I was unaware of the name Schwab  
11 nor his deposition.

12 Q. And I'm talking about his declaration.

13 A. Declaration, sorry.

14 Q. If you had known that Mr. Schwab testified  
15 that the failure rate of Cree consumer LED bulbs has  
16 never consistently exceeded two percent, would that  
17 change your opinion?

18 MR. BOURNE: Objection; foundation. You can  
19 answer the question.

20 THE WITNESS: It would not change my opinion.  
21 I would, as a scientist, scrutinize the validity of  
22 that data. I probably need to see a lot more than  
23 is provided in such a report, and do my own  
24 analysis of the confidence level of that data.

25 BY MS. LINDAHL:

1 Q. Did you ask for any failure data related to  
2 Cree consumer LED bulbs?

3 A. No.

4 Q. Assuming that Mr. Schwab is correct, for the  
5 purposes of this question, if he is correct that the  
6 failure rate has been below two percent, would that  
7 change your opinion?

8 MR. BOURNE: Objection; form, foundation.

9 MS. LINDAHL: He is an expert. I can ask him  
10 a hypothetical question.

11 THE WITNESS: Yeah, okay to answer?

12 MR. BOURNE: You can answer the question.

13 THE WITNESS: To repeat, I would not take his  
14 two percent number at face value. I need to see a  
15 lot of details behind that, especially quantities,  
16 and because any number of quantities will carry  
17 some error with it. So, if you gave me two  
18 percent, no, it would not change my opinion.

19 BY MS. LINDAHL:

20 Q. So just to make sure that you answered my  
21 question, my question wasn't whether you believe  
22 Mr. Schwab, my question is: If you assume for the  
23 purpose of this question that Mr. Schwab is correct,  
24 would that change your opinion?

25 A. We are hinged on the term correct, I would not

1 report to the rule of thumb of two times life per ten  
2 degrees C. Correct?

3 A. Yes.

4 Q. When you applied that rule to conclude that  
5 Cree consumer LED lamps would fail prematurely, did you  
6 consider the effect of other design elements such as  
7 ripple current?

8 A. There are specifications in these capacitors  
9 regarding ripple current as I recall. I did not know  
10 what the ripple current was for these lamps.

11 Q. Okay. If you had known what the ripple  
12 current was, could that have an effect on your  
13 application of what I'll call the rule of thumb?

14 A. Probably only adversely.

15 Q. What is the basis of your statement that  
16 knowing the ripple current of these lamps would  
17 adversely affect your conclusions?

18 A. It is a speculative inquiry here, so I'm going  
19 to make some careful assumptions, that what I do know is  
20 that power supplies for LEDs that are not as well  
21 designed as others may admit more ripple current to the  
22 LED. More ripple current through the circuit, more  
23 ripple current that needs to be attenuated or handled by  
24 the electrolytic capacitor, so that is a stress on the  
25 electrolytic capacitor.



1 mentioned, either a failure to light if the capacitor  
2 had failed in a nonfunctioning way. And I'm speculating  
3 now about the circuit design, which I did not analyze or  
4 have access to, that an electrolytic capacitor that is  
5 overstressed may -- may admit a less continuous -- a  
6 higher ripple current to the LED that might possibly  
7 result in flicker.

8 Q. You also, if you look with me -- same page  
9 paragraph 26.

10 A. Okay.

11 Q. In paragraph 26 you include in your opinion  
12 that the Cree consumer LED lamp design is not  
13 sufficiently conservative to ensure performance of the  
14 LEDs over their stated lifetime; is that accurate?

15 A. Well, it is a restatement.

16 Q. Is there anything about my restatement that  
17 you would change to make it more accurate?

18 A. Could you repeat it again?

19 MS. LINDAHL: Could we have it read back.

20 THE WITNESS: Thank you.

21 (The requested portion was read back by the  
22 court reporter.)

23 THE WITNESS: Yes, I would say that is  
24 accurate.

25 BY MS. LINDAHL:

1 A. Correct.

2 Q. And chromaticity shift does not mean failure  
3 to emit light. Correct?

4 A. Yes, sorry.

5 Q. That is okay.

6 You, in that paragraph, you have a bolded  
7 sentence that refers to an aggressive design target; do  
8 you see that?

9 A. Yes.

10 Q. And am I paraphrasing accurately to say that  
11 throughout this report you express the opinion that a  
12 more conservative design approach with respect to  
13 thermal management would have been better; is that  
14 accurate?

15 A. Yes.

16 Q. Can you cite me to any industry standard that  
17 you relied upon in reaching that opinion?

18 A. There are several industry standard reports  
19 quantifying the adverse effects of LEDs at high  
20 temperature, and either advising or prohibiting the use  
21 of an LED in operation above its certificated  
22 temperature, so, yes, there are guidelines in industry  
23 standards.

24 Q. Is it accurate, though, that your opinion is  
25 not that -- that your opinion is that Cree should have

1 designed its consumer LED lamps at some threshold below  
2 the maximum operating temperature?

3 A. Yes.

4 Q. And how did you determine what that design  
5 margin was that you believe is appropriate?

6 A. I explained in the report how I did that for  
7 each component.

8 Q. And that is your personal opinion. Correct?

9 A. It is a professional opinion.

10 Q. Can you cite me to a published source that  
11 contains that opinion?

12 A. I included in the report that there is no such  
13 source.

14 MS. LINDAHL: Let's take a ten-minute break.

15 THE VIDEOGRAPHER: This is the end of media  
16 unit number three, we are going off the record, the  
17 time on the video monitor is 2:01 p.m.

18 (Off the record.)

19 THE VIDEOGRAPHER: We are back on the record.  
20 This is the beginning of media unit number four,  
21 the time on the video monitor is 2:14 p.m.

22 MS. LINDAHL: Dr. Allen, I don't have any  
23 further questions for you right now.

24 I am going to keep this deposition open,  
25 because Dr. Allen has testified about a couple of